SPECIFICATION

TITLE OF THE INVENTION

SHOCK ABSORBER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a shock absorber and particularly relates to a shock absorber excellent in shock absorbing effect.

2. Description of the Related Art

There are known shock absorbers capable of relaxing an external force by a cushioning material containing therein the air (as disclosed by, for example, Kohyo (National Publication of Translated Version) Nos. 2001-504781, 11-509164, and 2002-87471, Kokai (Japanese Patent Unexamined Publication) Nos. 5-330578 and 6-40474, Japanese Utility Model Examined Publication No. 6-21873, Japanese Patent No. 3284004, Japanese Utility Model Examined Publication No. 56-44700, and Japanese Utility Model Unexamined Publication No. 58-180168).

The shock absorber of this type employed as a packaging device covers a package target with the cushioning material containing therein the air. Due to this, if an impact force is applied to the cushioning material, the impact force is directly transmitted to the package target through the cushioning material. The conventional shock absorbers, therefore, have a disadvantage of a weak shock absorbing effect.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a shock absorber capable of solving the conventional disadvantage.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic perspective view which illustrates an example in which a shock absorber in one embodiment of the present invention is used for packaging;

Fig. 2 is a schematic cross-sectional view taken along a line 2-2 of Fig. 1;

Fig. 3 is a schematic perspective view which illustrates a state in which a package target is contained in the shock absorber shown in Fig. 1;

Fig. 4 illustrates a process of manufacturing the shock absorber shown in Fig. 1;

Fig. 5 illustrates the process of manufacturing the shock absorber shown in Fig. 1, and illustrates a state in which after connecting a bag shown in Fig. 4 to a frame body, the frame body is filled with the air;

Fig. 6 is a schematic perspective view of a shock absorber different from that shown in Fig. 1 in another embodiment;

Fig. 7 is a schematic cross-sectional view shown in Fig. 6 which illustrates a state in which the package target is contained;

Fig. 8 is a schematic perspective view of a shock absorber different from that shown in Fig. 6 in yet another embodiment;

Fig. 9 is a schematic sectional view taken along a line

9-9 of Fig. 8;

Fig. 10 is a schematic, exploded perspective view which illustrates the shock absorber shown in Fig. 8 in an exploded manner;

Fig. 11 is a schematic perspective view of a shock absorber different from that shown in Fig. 8 in yet another embodiment;

Fig. 12 is a schematic cross-sectional view shown in Fig. 11 which illustrates a state in which the package target is contained;

Fig. 13 is a schematic cross-sectional view of a shock absorber different from that shown in Fig. 11 in yet another embodiment;

Fig. 14 is a schematic perspective view which illustrates a state in which a shock absorber different from that shown in Fig. 13 in still another embodiment is not put in a packaging box yet;

Fig. 15 is a schematic cross-sectional view which illustrates a state in which the shock absorber shown in Fig. 14 is put in the package box but the package target is not still put in the shock absorber;

Fig. 16 is a schematic cross-sectional view which illustrates a state in which the package target is put in the shock absorber shown in Fig. 15;

Fig. 17 is a schematic perspective view of a shock absorber different from that shown in Fig. 16 in still another embodiment;

Fig. 18 is a schematic, exploded perspective view which illustrates the shock absorber shown in Fig. 17 in an exploded

manner;

Fig. 19 is a schematic cross-sectional view which illustrates a state in which the shock absorber shown in Fig. 17 is put in the packaging box;

Fig. 20 is a schematic, exploded perspective view which illustrates the frame body shown in Fig. 17 in an exploded fashion;

Fig. 21 is a schematic, exploded perspective view which illustrates a shock absorber different from that shown in Fig. 17 in still another embodiment in an exploded manner; and

Fig. 22 is a schematic cross-sectional view which illustrates a state in which the shock absorber shown in Fig. 21 is put in the packaging box.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A shock absorber in one embodiment of the present invention will be described hereinafter with reference to Figs.

In Figs. 1 to 5, reference symbol 10 denotes a shock absorber. The shock absorber 10, which is used as, for example, the packaging device, includes a frame body 11 that has an opening portion 14 at a center containing therein the gas (e.g., the air) and that has a frame shape (e.g., a generally rectangular frame shape in this embodiment or a generally circular frame shape), and a member 12 provided in the frame body 11 to cross the opening portion 14 of this frame body 11 and supporting a package target 1. A material for the frame body 11 and the member 12 is, for example, a soft, high-airtightness synthetic resin film. The package target 1 is, for example, a thin object. To be specific,

the package target 1 is an electric product such as a notebook personal computer, a recording medium such as a CD or a DVD, an electric component, an electronic component, or the like.

As will be described later in detail, one frame-shaped side of the frame body 11 (a first cover body 11"a and a second cover body 11"b in this embodiment) is formed to be freely foldable. This side (the first cover body 11''a and the second cover body 11''b) closes an opening portion 17 of a bag 12. This closed state is held by holding means (a holding member 29 such as an adhesive tape, coupling of free ends of the first cover body 11"a and the second cover body 11"b to abutment portions of the frame body 11 abutted on the free ends by a heat seal, ultrasonic welding, or an adhesive, or the like) to keep the frame shape of the frame body 11.

While the member 12 may support the package target 1, the member may be the sheet bag 12 having a space in which the package target 1 is contained. Namely, as shown in Fig. 4, the bag 12 is formed by folding one sheet 16 or by superposing a plurality of (e.g., two) sheets 16 by thermal coupling. The bag 12 can contain therein the package target 1.

A first opening edge 14A and a second opening edge 14B are located on one side and the other side of the frame body 11, respectively. The member, e.g., the bag 12 is connected to an inner wall of the frame body 11 between the first opening edge 14A and the second opening edge 14B (e.g., at a position of about half a width W of the frame body 11) so as to cross the opening portion 14.

The shock absorber 10 is manufactured in steps of procedures shown in Figs. 4 and 5. Namely, as shown in Fig. 4, a rectangular front surface sheet 18 and a rear surface sheet 19 equal in shape to the front surface sheet 18 are prepared. Outer peripheral edges of the front surface sheet 18 and the rear surface sheet 19 are thermally bonded to one another, thereby forming longitudinal outer edge bonded portions 20 and 20' and lateral outer edge bonded portions 21 and 21' longitudinally and laterally, respectively. The front surface sheet 18 and the rear surface sheet 19 are thermally bonded by a heat seal or the like in parallel to these bonded portions (longitudinal outer edge bonded portions 20 and 20' and lateral outer edge bonded portions 21 and 21'), thereby forming a plurality of longitudinal bonded portions 22 and a plurality of lateral bonded portions 23.

The lateral bonded portions 23 are formed in a row at central positions of the front surface sheet 18 and the rear surface sheet 19 in a short length direction in parallel to the lateral outer edge bonded portions 21 and 21' with predetermined gaps by thermal bonding using a heat seal or the like. The longitudinal bonded portions 22 are formed on the front surface sheet 18 and the rear surface sheet 19 in a plurality of rows (three rows in this embodiment) in parallel to the longitudinal outer edge bonded portions 20 and 20' by thermal bonding using a heat seal or the like. A length X1 between a first line 22A of the longitudinal bonded portion 22 and one longitudinal outer edge bonded portion 20 is set substantially equal to a length

X2 between a second row 22B of the longitudinal bonded portion 22 and a third row 22C thereof. A length Y1 between the first row 22A and the second row 22B of the longitudinal bonded portions 22 is set substantially equal to a length Y2 between a third row 22C of the longitudinal bonded portion 22 and the other longitudinal outer edge bonded portion 20'.

In parallel with the thermal bonding of the front surface sheet 18 and the rear surface sheet 19, the bag 12 is manufactured. Namely, one rectangular or square sheet 16 is folded up and both side edges are thermally bonded by a heat seal or the like to form side edge bonded portions 24, thereby manufacturing the rectangular bag 12 having the opening portion 17 on one side. Alternatively, this bag 12 may be formed by superposing a plurality of (e.g., two) sheets 16 and thermally bonding both side edges and a bottom edge similarly to the above. A length of each side edge bonded portion 24 of the bag 12 is set to be substantially equal to the lengths X1 and X2 that prescribe the three rows of the longitudinal bonded portions 22 on the front surface sheet 18 and the rear surface sheet 19 thus superposed.

Next, as shown in Fig. 5, the front surface sheet 18 is located inside and the rear surface sheet 19 is located outside, and the front surface sheet 18 and the rear surface sheet 19 thus thermally bonded are folded at the first row 22A, the second row 22B, and the third row 22C of the longitudinal bonded portions 22, thereby forming the frame body 11 containing therein the gas. At this time, the first cover body 11''a and the second cover body 11''b are integrated with a first U-shaped body 11'a

and a second U-shaped body 11'b, respectively, so as to be foldable at the third row 22C of the longitudinal bonded portion 22, as will be described later.

As shown in Figs. 4 and 5, the both side edge bonded portions 24 of the bag 12 are thermally bonded to the frame body 11 by a heat seal or the like along the lateral bonded portions 23 while making the opening portion 17 of the bag 12 correspond to the first cover body 11''a and the second cover body 11''b. The both side edge bonded portions 24 of this bag 12 are thermally bonded to the frame body 11 between the longitudinal outer edge bonded portion 22 and the first row 22A of the longitudinal bonded portion 22 of the frame body 11 and between the second row 22B and the third row 22C of the longitudinal bonded portion 22, respectively. The shock absorber 10 is thus manufactured, the first cover body 11''a and the second cover body 11''b are folded at the third row 22C of the longitudinal bonded portion 22, and the opening portion 17 of the bag 12 is closed.

Among the peripheral edges of the bag 12, the both side edge bonded portions 24 of the bag 12 are thermally bonded to the frame body 11. Alternatively, the bottom edge opposite to the opening portion 17 of the bag 12 besides the both side edge bonded portions 24 of the bag 12 thereof may be thermally bonded to the frame body 11. That is, it suffices that the peripheral edges of the bag 12 excluding at least the opening portion 17 of the bag 12 are connected to a boundary between the first U-shaped body 11'a and the second U-shaped body 11'b and provided in the frame body 11 so that the bag 12 crosses the opening portion

14 of the frame body 11.

In this embodiment (Figs. 1 to 5), the frame body 11 includes a first frame body 11a and a second frame body 11b. In the next embodiment (Figs. 6 and 7), the frame body 11 includes the first frame body 11a, the second frame body 11b, a third frame body 11c, and a fourth frame body 11d. Although it suffices to provide one frame body 11 according to the present invention, it is preferable that the frame body 11 includes at least the first frame body 11a and the second frame body 11b. The first frame body 11a is formed to contain therein the gas (e.g., the air) in a vacant portion surrounded by an upper half of the longitudinal outer edge bonded portion 20, the lateral outer edge bonded portion 21, an upper half of the longitudinal outer edge bonded portion 20', and the lateral bonded portions 23 shown in Fig. 4. The first frame body 11a is folded at the first row 22A, the second row 22B, and the third row 22C and can, therefore, hold the frame shape by the holding member, e.g., the adhesive tape 29. In addition, the first frame body 11a includes the first U-shaped body 11'a of a generally U-shape, and the first cover body 11''a that opens and closes an opening portion of this first U-shaped body 11'a.

Similarly to the first frame body 11a, the second frame body 11b is formed to contain therein the gas (e.g., the air) in a vacant portion surrounded by a lower half of the longitudinal outer edge bonded portion 20, the lateral outer edge bonded portion 21', a lower half of the longitudinal outer edge bonded portion 20', and the lateral bonded portions 23. The second

frame body 11b is folded at the first row 22A, the second row 22B, and the third row 22C and can, therefore, hold the frame shape by the adhesive tape 29. In addition, the second frame body 11b includes the second U-shaped body 11'b of the generally U-shape, and the second cover body 11''b that opens and closes an opening portion of this second U-shaped body 11'b.

The first frame body 11a and the second frame body 11b are parallel to each other. The first U-shaped body 11'a and the second U-shaped body 11'b are connected to each other (by, for example, the lateral bonded portions 23) and thereby integrated with each other. The peripheral edges of the bag 12 excluding at least the opening portion 17 of the bag 12 are connected to the boundary between the first U-shaped body 11'a and the second U-shaped body 11'b. In this embodiment, for example, the both side edge bonded portions 24 of the bag 12 are thermally bonded to the frame body 11 between the longitudinal outer edge bonded portion 20 and the first row 22A of the longitudinal bonded portion 22 of the frame body 11 and between the second row 22B and the third row 22C of the longitudinal bonded portion 22, respectively. The opening portion 17 of the bag 12 is opened and closed by the integrated first cover body 11"a and the second cover body 11"b, and the opening portion 17 of the bag 12 is closed by the first cover body 11''a and the second cover body 11''b, and the closed state is held by the holding member (e.g., adhesive tape) 29.

Meanwhile, as shown in Figs. 4 and 5, many bag portions 15 are formed on the front surface sheet 18 and the rear surface

sheet 19 to be surrounded by the longitudinal outer edge bonded portions 20 and 20', the lateral outer edge bonded portions 21 and 21', the longitudinal bonded portion 22, and the lateral bonded portion 23. The frame body 11 is constituted by coupling these bag portions 15. Further, while the longitudinal outer edge bonded portions 20 and 20' and the lateral outer edge bonded portions 21 and 21' are formed continuously, the longitudinal bonded portions 22 and the lateral bonded portions 23 are formed not continuously but to have predetermined gaps. Due to this, the many bag portions 15 constituting the first U-shaped body 11'a, the first cover body 11''a, the second U-shaped body 11'b, and the second cover body 11''b are communicated with one another by vent portions 26 formed by the predetermined gaps of the longitudinal bonded portion 22 and the lateral bonded portion 23. Accordingly, the first U-shaped body 11'a, the first cover body 11''a, the second U-shaped body 11'b, and the second cover body 11''b are communicated with one another using the vent portions 26 when filling the air into the bag portions 15.

As shown in Figs. 4 and 5, an air inlet / outlet 27 is provided in the frame body 11. This air inlet / outlet 27 has a function of a check valve 28 that is formed by thermally bonding part of opposed films in a shape of an unfolded fan. This check valve 28 prevents the air filled into the frame body 11 from being discharged to the outside. Further, by supplying the air from the air inlet / outlet 27 through the check valve 28, the air is filled into all the bag portions 15 of the frame body 11 through the vent portions 26 as shown in Fig. 3.

Therefore, while the air is filled into the bag portions 15 of the frame body 11 (as shown in Fig. 3), the package target 1 is contained in the bag 12 through the opening portion 17 of the bag 12. The opening portion 17 of the bag 12 is closed by the first cover body 11''a and the second cover body 11''b thus integrated with each other, and the closed state is held by the holding member 29. The package target 1 is packaged in the shock absorber 10, and can be carried or stored either by containing the shock absorber 10 in a rectangular parallelepiped or cubic package box (not shown) or without containing the shock absorber 10 in the package box.

As a result, even if an impact load is applied to the frame body 11, the impact force is not directly transmitted to the member 12 that supports the package target 1, whereby the package target 1 can be protected.

The shock absorber 10 in this embodiment has the single member (e.g., the bag) 12 provided in the frame body 11. However, the number of members 12 is not limited to one according to the present invention. As shown in Figs. 6 and 7, a plurality of members (e.g., bags) 12 may be provided in the frame body 11. In an embodiment shown in Figs. 6 and 7, the number of the members (e.g., bags) 12 is three, and the frame body 11 includes the first frame body 11a that includes the first U-shaped body 11'a of generally U shape and the first cover body 11''a opening and closing the opening portion of this first U-shaped body 11'a, the second frame body 11b that includes the second U-shaped body 11'b of generally U shape and the second cover body 11''b opening

and closing the opening portion of this second U-shaped body 11'b, the third frame body 11c that includes a third U-shaped body 11'c of generally U shape and a third cover body 11''c opening and closing the opening portion of this third U-shaped body 11'c, the fourth frame body 11d that includes a fourth U-shaped body 11'd of generally U shape and a fourth cover body 11''d opening and closing the opening portion of this fourth U-shaped body 11'd.

It is noted that the same elements as those in the preceding embodiment are denoted by the same reference symbols as those in the preceding embodiment, respectively, and will not be described herein. (Likewise, in embodiments shown in Figs. 8 to 22, the same elements as those in the embodiments shown in Figs. 1 to 7 are denoted by the same reference symbols as those in Figs. 1 to 7, respectively, and will not be described.)

Furthermore, the member 12 packaged in the shock absorber 10 in the embodiments described above is the bag. As shown in Figs. 8 to 10, the member 12 may be a member (e.g., a sheet) that supports the package target 1 instead of the bag. In this case, a cover 42 engaged with an inner wall of the frame body 11 may be put on the package target 1 so that the package target 1 is prevented from protruding from the frame body 11 even if the impact load is applied to the frame body 11.

As shown in Figs. 11 and 12, the member 12 may be provided in the frame body 11 so as to cross the opening portion 14 of the frame 11, an opposed member 12' may be provided to be opposed to this member 12 and cross the opening portion 14 of the frame

body 11, and the package target 1 may be provided between the opposed member 12' and the member 12. A material for the opposed member 12' is the same as that for the member 12, e.g., the soft, high-airtightness synthetic resin film.

The member 12 and the opposed member 12' shown in Figs. 11 and 12 are soft and not rigid. The member 12 and the opposed member 12' shown in Fig. 13, by contrast, are shape holding members that hold the shape of the opening portion 14 of the frame body 11. The shape holding member 12' is made of, for example, a corrugated cupboard, plastic, a particle board, or a paperboard. The member 12 and the shape holding member 12' constitute a kind of a structure and can protect the package target 1 from an external force acting on end faces of peripheral edges of the member 12 and the shape holding member 12'.

In the frame body 11, if the peripheral edge of the shape holding member 12' is engaged with a boundary e between the first frame body 11a and the second frame body 11b, that of the member 12' is engaged with a boundary d between the second frame body 11b and the third frame body 11c, then the member 12 and the shape holding member 12' can be easily provided in the frame body 11 so as to cross the opening portion 14 of the frame body 11. The package target 1 is provided between the member 12 and the shape holding member 12'.

Furthermore, as shown in Figs. 14 to 16, the shape holding member 12' may be divided (to, for example, division pieces 12'a and 12'b), and the shock absorber 10 may be contained in a package box P.

Figs. 17 to 20 illustrate that two shock absorbers 10 are employed. The member 12 shown to be packaged in this shock absorber 10 is the shape holding member (made of, for example, a corrugated cupboard, plastic, a particle board, or a paperboard) that holds the shape of the opening portion 14 of the frame body 11. A package target engagement opening portion 12a engaged with the package target 1 is provided in this shape holding member 12.

If the shape of the package target 1 is such that the package target 1 has both protruding end faces, it is preferable to employ the two shock absorbers 10 shown in Fig. 20. In particular, even if the shape of the package target 1 changes, it is possible to deal with the change of shape by changing the shape of the package target engagement opening portion 12a engaged with the package target 1.

Moreover, the shock absorbers 10 shown in Figs. 17 to 20 are appropriate if the both end faces of the package target 1 protrude. However, they are inappropriate if the both end faces of the package target 1 do not protrude as shown in Fig. 21. In that case, the shock absorbers 10 shown in Figs. 21 and 22 may be employed.

In each of the shock absorbers 10 shown in Figs. 21 and 22, not only the shape holding member 12 having the package target engagement opening portion 12a but also the shape holding member 12' that holds the shape of the opening portion 14 of the frame body 11 is provided so as to cross the opening portion 14 of the frame body 11 and so as to be opposed to the end face of

the package target 1.

This shape holding member 12' (made of, for example, a corrugated cupboard, plastic, a particle board, or a paperboard) can function as a stopper that prevents the movement of the package target 1 even if the package target 1 is to move.